

CLAIMS:

1. A microelectronic assembly comprising:
 - (a) a dielectric element having an upwardly-facing first surface and a downwardly-facing second surface and having terminals exposed at said second surface;
 - (b) a first microelectronic element overlying said first surface of said dielectric element; and
 - (c) a second microelectronic element overlying said first microelectronic element,
said first and second microelectronic elements being electrically connected with said terminals, said terminals being movable with respect to said first microelectronic element, said assembly having a thickness above said terminals of less than 1.2 mm.
2. An assembly as claimed in claim 1 wherein at least some of said terminals are disposed on a region of said dielectric element beneath said first microelectronic element.
3. An assembly as claimed in claim 2 further comprising joining units bonded to at least some of said terminals, said joining units having a height of about 300 microns or less.
4. An assembly as claimed in claim 3 wherein said height of said joining units is about 150 microns or less.
5. An assembly as claimed in claim 4, wherein said thickness is less than 1 mm.
6. An assembly as claimed in claim 5 wherein said thickness is less than 0.7 mm.
7. An assembly as claimed in claim 3 wherein said joining units include solder balls.
8. An assembly as claimed in claim 7 further comprising a substrate having contact pads, at least some of said terminals being connected to said contact pads by said joining units.

9. A microelectronic assembly, comprising:

(a) a dielectric element having a first surface, a second surface opposite the first surface and a plurality of electrically conductive terminals exposed on said second surface;

(b) a first microelectronic element having a face surface, a back surface, and a plurality of first contacts exposed on the face surface, wherein said first microelectronic element is disposed over the dielectric element so that the face surface faces toward said dielectric element;

(c) a plurality of first elongated leads, at least some of the first contacts being electrically connected with at least some of the terminals on said dielectric element through said first elongated leads;

(d) a second microelectronic element having a top surface, a bottom surface, and a plurality of second contacts exposed on the top surface, said second microelectronic element being disposed over the first microelectronic element so that the top surface faces away from the dielectric element, and the bottom surface of the second microelectronic element confronts the back surface of the first microelectronic element; and

(e) a plurality of second elongated leads, at least some of the second contacts being electrically connected with at least some of the terminals on said dielectric element through said second elongated leads,

wherein at least some of the terminals are movable with respect to the first contacts.

10. An assembly as claimed in claim 9 wherein said first microelectronic element is disposed between said second microelectronic element and said first surface of said dielectric element.

11. An assembly as claimed in claim 10, wherein at least some of the terminals are movable with respect to the second contacts.

12. An assembly as claimed in claim 11, further comprising a compliant layer disposed between the surface of the dielectric element and the face surface of the first microelectronic element.

13. An assembly as claimed in claim 12, further comprising an adhesive disposed between the back surface of the first microelectronic element and the bottom surface of the second microelectronic element.

14. An assembly as claimed in claim 13, wherein said adhesive includes a compliant material.

15. An assembly as claimed in claim 14, further comprising an encapsulant disposed over the second leads.

16. An assembly as claimed in claim 15, wherein said encapsulant is further disposed over the top surface of the second microelectronic element.

17. An assembly as claimed in claim 16, wherein said encapsulant is comprised of a high modulus material.

18. An assembly as claimed in claim 17, wherein said encapsulant is comprised of an epoxy.

19. An assembly as claimed in claim 9, wherein said dielectric element is flexible.

20. An assembly as claimed in claim 19, wherein said dielectric element is comprised of polyimide.

21. An assembly as claimed in claim 10, wherein at least one of the terminals which is movable with respect to one of the first contacts underlies said first microelectronic element.

22. An assembly as claimed in claim 10, wherein at least some of said first leads are bond ribbons.

23. An assembly as claimed in claim 22, wherein each of said bond ribbons is curved.

24. An assembly as claimed in claim 22, wherein said dielectric element has at least one aperture extending between said first and second surfaces and bond pads disposed on said second surface, said leads and bond pads being integrally formed with said bond ribbons, and said first leads extend from said first contacts through said aperture.

25. An assembly as claimed in claim 22, wherein at least some of said second leads are wire bonds.

26. An assembly as claimed in claim 10, wherein at least some of said first leads are wire bonds.

27. An assembly as claimed in claim 26, wherein said dielectric element has at least one aperture extending between said first and second surfaces and bond pads disposed on said second surface, and said first leads extend from said first contacts through said aperture to said bond pads.

28. An assembly as claimed in claim 9, further comprising

(f) a third microelectronic element disposed over the second microelectronic element, said third microelectronic element having a top surface facing away from the first surface of the dielectric element and a bottom surface facing toward the top surface of the second microelectronic element, and a plurality of third contacts exposed on the top surface of the third microelectronic element; and

(g) a plurality of third elongated leads electrically connecting at least some of the third contacts with some of the terminals.

29. An assembly as claimed in claim 28, wherein at least some of said third leads are wire bonds.

30. An assembly as claimed in claim 9, wherein said first and second microelectronic elements are semiconductor chips.

31. An assembly as claimed in claim 9, wherein said first microelectronic element is comprised of two

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semiconductor chips which are disposed side by side and said second microelectronic element is disposed over both said chips.

32. An assembly as claimed in claim 10, further comprising an additional microelectronic element disposed on the second surface of the dielectric element, said additional microelectronic element underlying at least a portion of the first microelectronic element.

33. A microelectronic assembly comprising:

(a) first and second microelectronic elements, each said microelectronic element having a face surface, a back surface and opposite first and second edges extending between the face and back surfaces of such element, said second microelectronic element overlying said first microelectronic element with the face surface of the second microelectronic element confronting a surface of the first microelectronic element, said microelectronic elements being staggered so that a first edge region of the second microelectronic element face surface adjacent the first edge of the second microelectronic element projects in beyond the first microelectronic element and so that the second edge of the second microelectronic element does not project beyond the first microelectronic element, said second microelectronic element having contacts exposed on said face surface of said second microelectronic element within said first edge region, said first microelectronic element having contacts exposed on its face surface;

(b) a dielectric element having first and second surfaces, said first and second microelectronic elements being disposed over said first surface of said dielectric element with said first microelectronic element between said dielectric element and said second microelectronic element;

(c) electrically conductive features on said dielectric element; and

(d) leads extending between at least some of said contacts of each said microelectronic element and at least some of said conductive features on said dielectric element.

34. An assembly as claimed in claim 33 wherein said conductive features include terminals exposed on said second surface of said dielectric element.

35. An assembly as claimed in claim 33 wherein said face surface of said second microelectronic element confronts said rear surface of said first microelectronic element.

36. An assembly as claimed in claim 35 wherein said contacts of said first microelectronic element are disposed in a first edge region of the face surface of the first microelectronic element adjacent the first edge thereof, and where said first edge region of said second microelectronic element projects beyond said first edge of said first microelectronic element.

37. An assembly as claimed in claim 36 wherein said dielectric element has a first edge and said first edge regions of said first and second microelectronic elements project beyond said first edge of said dielectric element, and wherein said leads extend around said first edge of said dielectric element.

38. An assembly as claimed in claim 37 wherein said conductive features include bond pads exposed on said second surface of said dielectric element adjacent said first edge of said dielectric element, and wherein said leads include wire bonds extending between said contacts of said microelectronic elements and said bond pads.

39. An assembly as claimed in claim 37 wherein said first and second microelectronic elements are substantially identical to one another.

40. An assembly as claimed in claim 38 wherein said conductive features include only a single layer of metallization.

41. An assembly as claimed in claim 33 further comprising a substrate having contact pads, and joining elements connecting at least some of said terminals to said contact pads.

42. A microelectronic assembly including:

(a) a dielectric element having first and second surfaces;

(b) conductive features on said dielectric element including elongated traces, terminals connected to said traces, bond ribbons formed integrally with at least some of said traces, and bond pads formed integrally with others of said traces, said terminals being exposed on said second surface of said dielectric element;

(c) first and second microelectronic elements, each said microelectronic element having a face surface, a back surface and contacts exposed on the face surface of the microelectronic element, said first microelectronic element overlying the first surface of the dielectric element with the face surface of the first microelectronic element facing downwardly toward the first surface of the dielectric element and with the back surface of the first microelectronic element facing upwardly away from the dielectric element, the second microelectronic element overlying the first microelectronic element;

(d) wire bonds connecting the contacts of the second microelectronic element with said bond pads, said bond ribbons extending to the contacts of the first microelectronic element.

43. An assembly as claimed in claim 42 wherein said face surface of said second microelectronic element faces upwardly away from said dielectric element.

44. An assembly as claimed in claim 43 wherein each said microelectronic element has opposite first and second edges extending between its face and back surfaces, and wherein said

contacts of each said microelectronic element are disposed in an edge region adjacent the first edge of that microelectronic element, said first edge of said second microelectronic element being disposed adjacent the second edge of said first microelectronic element.

45. An assembly as claimed in claim 44 wherein said first and second microelectronic elements are substantially identical to one another.

46. An assembly as claimed in claim 42 wherein said conductive features include only a single layer of metallization.

47. An assembly as claimed in claim 42 further comprising a substrate having contact pads, at least some of said terminals being connected to said contact pads by said joining units.

48. A stacked microelectronic assembly, comprising:

- a) a first subassembly comprising:
 - i) a first microelectronic element;
 - ii) a first dielectric element having first and second surfaces and conductive features on said first dielectric element including a plurality of first terminals and first lands, said first terminals and first lands being exposed on said second surface, said first microelectronic element overlying said first surface of said first dielectric element and being electrically connected with at least some of said conductive features on said first dielectric element;
- b) a second subassembly comprising:
 - iii) a second microelectronic element; and
 - iv) a second dielectric element having first and second surfaces and conductive features on said second dielectric element including second lands exposed on said second surface of said second dielectric element, wherein the second surface of the first dielectric element and the second surface of the second dielectric element confront each other

and said first lands overlie said second lands and are electrically connected thereto; and

c) joining units connected to at least some of said terminals of said first subassembly and projecting from said second surface of said first dielectric element beyond said second subassembly.

49. An assembly as claimed in claim 48 wherein said terminals are disposed in a peripheral region of said first dielectric element and said first lands are disposed in a central region of said first dielectric element.

50. An assembly as claimed in claim 48 wherein at least some of said first lands underlie the first microelectronic element.

51. An assembly as claimed in claim 48, wherein said first and second lands are solder-bonded to one another.

52. An assembly as claimed in claim 48, wherein said terminals are movable with respect to said first microelectronic element.

53. An assembly as claimed in claim 48, wherein said second lands are movable with respect to said second microelectronic element.

54. An assembly as claimed in claim 48, wherein said conductive features on said second dielectric element include traces extending from at least some of said lands along said second dielectric element and bond ribbons formed integrally with said traces, said bond ribbons being connected with said second microelectronic element.

55. An assembly as claimed in claim 48, wherein, said first microelectronic subassembly comprising a third microelectronic element overlying said first microelectronic element and being electrically connected with said at least some of said conductive features on said first dielectric element.

56. An assembly as claimed in claim 55, at least one of said conductive features on said first dielectric element being movable with respect to at least said first microelectronic element.

57. An assembly as claimed in claim 48, wherein said first microelectronic element comprises a face surface, a back surface, and a plurality of first contacts exposed on the face surface and is disposed over said first dielectric element with said face surface confronting said first dielectric element, said first microelectronic subassembly comprising

a plurality of first elongated leads, electrically connecting at least some of the first contacts with at least some of said conductive features on said first dielectric element;

a third microelectronic element having a top surface, a bottom surface, and a plurality of second contacts exposed on the top surface, said third microelectronic element being disposed over the first microelectronic element so that the top surface faces away from the first dielectric element and the bottom surface confronts the back surface of the first microelectronic element; and

a plurality of second elongated leads, at least some of the second contacts being electrically connected with at least some of said conductive features on said first dielectric element through said second elongated leads.

58. An assembly as claimed in claim 57, at least one of said conductive features on said first dielectric element being disposed beneath said face surface of said first microelectronic element and movable with respect to at least one of said first contacts.

59. An assembly as claimed in claim 48, wherein said first microelectronic element comprises

first and second semiconductor chips, each said semiconductor chip having a face surface, a back surface and

first and second edges extending between the face and back surfaces, said second semiconductor chip overlying said first semiconductor chip with the face surface of the second chip confronting a surface of the first chip with the first edges of said first chips disposed adjacent the first edge of said second chip, said chips being staggered so that an edge region of the second chip face surface adjacent the first edge of the second chip projects in a first lateral direction beyond the first edge of the first chip and so that the second edge of the second chip does not project beyond the second edge of the first chip, said second chip having contacts exposed on said face surface of said second chip within said first edge region, said first chip having contacts exposed on its face surface,

said first and second chips being disposed over said first surface of said first dielectric element with said first chip between said first dielectric element and said second chip; and

leads extending between at least some contacts of each said chip and said at least some of said conductive features on said first dielectric element.

60. An assembly as claimed in claim 59, wherein said conductive features on said first dielectric element include elongated traces, at least some of said first terminals being electrically connected with said traces, bond ribbons formed integrally with at least some of said traces, and bond pads formed integrally with others of said traces, said first microelectronic element comprising

first and second semiconductor chips, each said semiconductor chip having a face surface, a back surface and contacts exposed on the face surface of the chip, said first chip overlying the first dielectric element with the face surface of the first chip confronting the first surface of the first dielectric element and with the back surface of the

first chip facing upwardly away from the first dielectric element, the second chip overlying the first chip; and

wire bonds connecting the contacts of the second chip with said bond pads, said bond ribbons extending to the contacts of the first chip.

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